

## Two new species of *Calandrinia* (Portulacaceae) from southern Western Australia

Frank J. Obbens

c/o Western Australian Herbarium, Department of Parks and Wildlife,  
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983  
Email: frank.obbens@aapt.net.au

### Abstract

Obbens, F.J. Two new species of *Calandrinia* (Portulacaceae) from southern Western Australia. *Nuytsia* 24: 37–43 (2014). Two new species in *Calandrinia* Kunth. sect. *Pseudodianthoideae* Poelln., *C. baccata* Obbens and *C. oraria* Obbens, are described as new.

### Introduction

This paper is the latest in a series that endeavours to document new species of *Calandrinia* Kunth. from Western Australia. Two new species are described herein, both from southern Western Australia. *Calandrinia baccata* is morphologically variable and widely distributed within the South-West Botanical Province extending into the Eremaean Botanical Province, while *C. oraria* is restricted to the west coast of the South-West Botanical Province.

### Methods

Methods used are the same as those described in Obbens (2011). The term ‘collicula’ (pl. colliculi) is herein used to describe an individual domed protuberance characteristic of a colliculate seed surface pattern, as commonly seen in many *Calandrinia* species.

SEM images were produced using a Joel NeoScope JCM-5000 scanning electron microscope, operating at a current of 10Kv and working distance of 45 mm. Seeds were sputter-coated with gold before scanning.

Biogeographic regions used for species distributions and mapping follow the *Interim Biogeographical Regionalisation for Australia (IBRA) Version 6.1* (Department of Sustainability, Environment, Water, Population and Communities 2004).

### Taxonomy

***Calandrinia baccata* Obbens, sp. nov.**

*Type: c.* 1.8–2.2 km north of Goomalling on road to Wongan Hills, then just over rail crossing turn

left c. 150–200 m along rail service track to collection site, Western Australia, 18 September 2013, F. Obbens & R. Davis FO 1/13 (*holo*: PERTH 08477280; *iso*: AD, CANB, MEL).

*Calandrinia* sp. Blackberry (D.M. Porter 171), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed September 2013].

*Annual herbs*, semi-erect to erect, 30–310 mm tall, 20–190 mm wide, glabrous or occasionally with hairs; root system comprising a weak taproot with several weak laterals. *Basal leaves* fleshy, narrowly elliptic to narrowly obovate, occasionally linear and sometimes broader, 7.5–72 mm long, 1.9–4.7 mm wide, most with a shallow medial groove on adaxial surface, green or grey-green. *Stems* few to several (usually 1–6), 6–105 mm long, radiating from base, rarely once-branched. *Stem leaves* alternate, a few widely spaced, most distally clustered at stem ends, fleshy, narrowly elliptic to narrowly obovate, occasionally broader, 3.5–6 mm long, 1–3.7 mm wide, occasionally with a weak medial groove on adaxial surface. *Scapes* 19–137 mm long, often with one residual leaf/bract at midpoint along scape, occasionally once-branched. *Inflorescence* generally comprising a loose cyme; *axis* 10–150 mm long, bare except for 3–several  $\pm$  scarious bracts outside or opposite the pedicel axils, initially alternate soon becoming opposite on upper axis; *axis bracts* appressed to  $\pm$  spreading, narrowly triangular to triangular, 1.9–3.6 mm long, 0.9–2.2 mm wide, mucronate and often with a recurved apex. *Pedicels* 3.5–25 mm long in flower, to 35 mm long and strongly reflexed in fruit. *Flowers* 12–26 mm diam.. *Sepals* thick, ovate to broadly ovate, 3.2–6 mm long, 2.6–4.5 mm wide, free to base, mucronate, with a moderately prominent midvein and several other weaker veins. *Petals* 5, light to mid-pink, obovate to very broadly obovate, occasionally shallowly depressed or notched at apex, 3.7–11.5 mm long, 2.6–11 mm wide, free to base. *Stamens* (10–)50–65, in (1–)2–3 rows, alternating long and short (when one row) or with longer inner and shorter outer series (when 2 or 3 rows); filaments free, 1.1–3.5 mm long, attached to top of basal ring beneath ovary, basally adaxially papillose; anthers broadly elliptic to broadly oblong in outline, 0.45–1 mm long, 0.35–0.5 mm wide, versatile, extrorse, dehiscing longitudinally. *Ovary* ellipsoid to obovoid, 1.1–1.65 mm diam., brown. Stigmas 3, squat-triangular, lengthening, spreading and becoming more linear with maturity, 0.85–2 mm long, free to base, with a dense covering of moderately long trichomes. *Capsule* ovoid to broadly ovoid, 3.9–5.6 mm long, 1.8–3.6 mm wide, obtuse, usually slightly to moderately protruding beyond the sepals; valves 3, splitting from apex to base with age. Seeds 40–86, dark red-brown to black, semi-glossy to glossy (occasionally duller), sub-reniform to reniform, 0.55–0.85 mm long, 0.5–0.75 mm wide, 0.3–0.45 mm thick; surface strongly colliculate, the colliculi varying from polygonal in plan view and moderately domed to more rounded in plan view and almost hemispherically domed.

*Diagnostic features.* *Calandrinia baccata* has black reniform seeds with a surface pattern superficially resembling a blackberry.

*Other specimens examined.* WESTERN AUSTRALIA: Charles Gardner Reserve, 15 Sep. 1998, E. Bennett & K. Del Fante CG 1.7b (PERTH); W end of Mingenew Reserve, 6 Sep. 2007, R. Davis 11219 (PERTH); S of River Loop Rd, Jurien Bay, 4 Oct. 2004, M. Hayes HRTA 67 (PERTH); W of Bencubbin–Kellerberrin Rd, S of Gilham Rd and N of Harrod Rd, 16 Sep. 2003, M. Hislop & M. Davis WW 93.36 (PERTH); E of Old Geraldton Rd between Coomberdale East Rd and Carino Rd, NE of Moora, 19 Sep. 2005, M. Hislop, R. Ovens & G. Troup WW148-22 (PERTH); decomposed granite breakaways, c. 800 m WNW of granite peak of Geeraning Rock, NE of Mukinbudin, 16 Oct. 2005, M. Hislop & F. Hort MH3533B (PERTH); N of Sadler Rd, E of Goomalling–Meckering Rd, SE of Goomalling, 13 Sep. 2007, M. Hislop & M. Griffiths WW202-29A (PERTH); S of intersection of

Wubin East Rd and Mitchell Rd, NE of Dalwallinu, 9 Sep. 2008, *M. Hislop, J. Berger & C. Curnow* WW219-14 (PERTH); S of Bruce Rock-Doodlakine Rd between Morrison and Eujinyn Rds, S of Doodlakine, 16 Sep. 2008, *M. Hislop & P. Lewis* WW222-25b (PERTH); 146 km N of Southern Cross, 32 km SSW of Johnston Range, 2 km SW of Pigeon Rocks, 27 Sep. 2010, *M. Maier & P.L. de Kock* BES MM 1066 (PERTH); Blue Hills Range, Windaning Hill, 17 Sep. 2005, *A. Markey & S. Dillon* 3952 (PERTH); 39 km N of Kalbarri turnoff [39 km N along North West Coastal Hwy from junction of Kalbarri turnoff], 29 Sep. 1989, *B. Nordenstam & A. Anderberg* 174 (PERTH); Coomaloo Picnic area next to Brand Highway near Jurien Bay turnoff, 1 Oct. 2002, *F. Obbens* 27/02 (PERTH); c. 30 m W of turnoff into Lake Indoon on the Eneabba–Leeman Rd, 18 Sep. 2003, *F. Obbens* FO 39/03 (PERTH); southern boundary of Yardanogo Nature Reserve, S of Mount Adams Rd, 3 Sep. 2004, *F. Obbens & G. Woodman s.n.* (PERTH); Ellendale Pool, 15 Sep. 2004, *F. Obbens & F. Hort* FO 39/04 (PERTH); Coolcalalaya Station, 16 Sep. 2004, *F. Obbens & F. Hort* FO 50/04 (PERTH); c. 400–500 m N along Ardingly Rd, S from junction with the Mingenew–Mullewa Rd, 17 Aug. 2008, *F. Obbens, F. Hort & J. Hort* FO 02/08 (PERTH); Carnarvon–Mullewa Rd, c. 18.8 km S of junction with the Byro–Woodleigh Rd and then c. 100 m W of road, 21 Aug. 2008, *F. Obbens, F. Hort & J. Hort* FO 27/08 (PERTH); 74.6 km S along the Morawa–Yalgoo Road from junction with the Geraldton–Mt Magnet Road, near Mellenbye Station turnoff, 18 Sep. 2008, *F. Obbens, F. Hort & J. Hort* FO 51/08 (PERTH); Saffron East Rd, just past most eastern contour bank, Riverside Ajana, 19 Aug. 2001, *D.M. Porter* 171 (PERTH); site 59, c. 8 km N of Nembudding, ENE of Wyalkatchem, 10 Oct. 2001, *L.W. Sage & C. Swift* WW59-48 (PERTH); Burnerbinmah Station, 9 Sep. 1996, *S. Toole et al.* 29 (PERTH); SW (of Great Southern) Hwy between Beverley and Mount Kokeby, Reserve No. 2026/7, 8 Oct. 2003, *T. Watson* 496 (PERTH).

*Phenology.* Flowers and fruits from August to October. Flowering and fruiting occurs earlier at northern locations than in the south.

*Distribution and habitat.* *Calandrinia baccata* occurs in the Geraldton Sandplains bioregion from Eurardy Station in the north to Jurien Bay area in the south and from there inland in a broad band through the Avon Wheatbelt bioregion to the Narrogin area. Several collections also occur in the adjacent Murchison, Yalgoo and Coolgardie bioregions of the Eremaean Botanical Province from inland of Shark Bay in the north to east of Yellowdine in the south (Figure 1).

*Calandrinia baccata* is found in a wide variety of habitats including claypan fringes and creeklines, on or near granites, on sandplains, on ironstone ridges and outwash areas and on breakaways and slopes. Most collections have been found on red-brown sandy loam plains within open woodland frequently dominated by *Eucalyptus loxophleba*. On coastal plains it often occurs in grey sand with scrub-heath communities of *Banksia attenuata*, *B. prionotes* and *Xanthorrhoea preissii* with numerous other shrub or herb species. In other situations, such as claypans, it occurs under *Eucalyptus camaldulensis* woodland; when near granite it usually occurs within open or semi-closed heath with a diverse range of associated species. The most northern collection was growing in residual clayey loam soil pockets on top of a degrading granite breakaway containing an open shrubland of *Acacia rhodiophloia*, *Ptilotus obovatus* and *Micromyrtus sulphurea* with an understorey of chenopods and annuals.

*Conservation status.* *Calandrinia baccata* is common and widespread throughout its range including occurrences in a number of reserves (but see notes below about the near coastal variant).

*Etymology.* From the Latin *baccatus* (berry-like) in reference to the superficial likeness of the seed surface pattern to a blackberry.

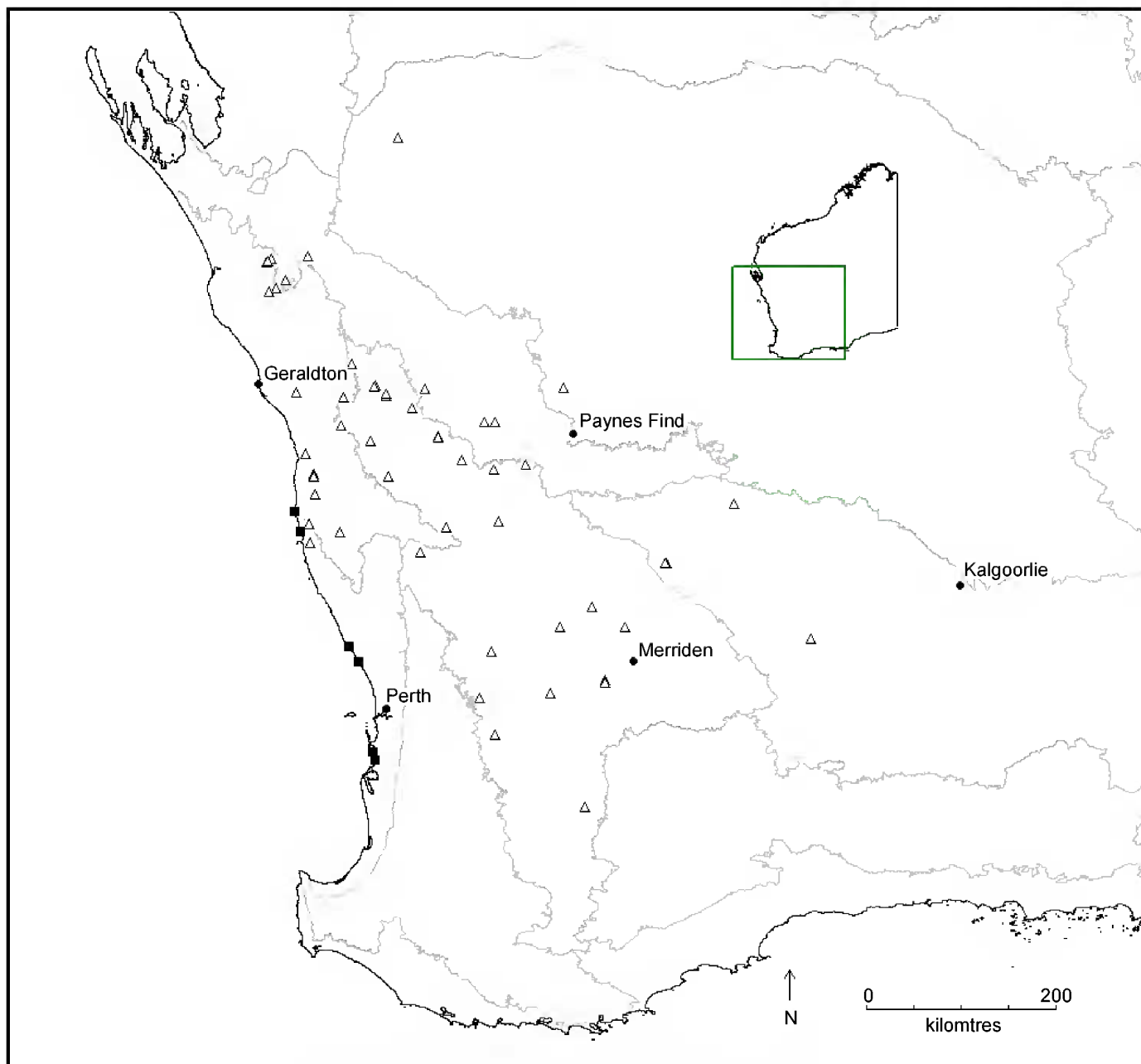


Figure 1. Distribution of *Calandrinia baccata*  $\Delta$  and *C. oraria*  $\blacksquare$  in Western Australia.

*Notes.* *Calandrinia baccata* has been confused with *C. polyandra* Benth., a species with brown seeds which are finely to moderately colliculate with only slightly domed colliculi. *Calandrinia baccata* by contrast has black seeds which are moderately to coarsely colliculate with more distinctly domed colliculi. The seed surface of *C. baccata* is somewhat similar to *C. oraria* Obbens, suggesting a possible relationship; the distributions of these taxa do not overlap.

As circumscribed, *C. baccata* is somewhat variable across its range. Plants are generally larger in all respects in the north and west than in southern or more inland areas. Several collections from sandplains close to the west coast between Jurien Bay and the Dongara area are distinctive compared with inland collections. Note that these near-coastal collections were made from shrub heath communities on grey sand, whereas other collections occur on sandy loams in woodlands and a variety of other situations described above. This near-coastal variant has seeds with colliculi that are more rounded in plan view and almost hemispherically domed. The more widespread and commonly observed inland variant has colliculi that are polygonal and less domed (Figure 2 A–F). Several intergrade collections, however, occur on eastern parts of the coastal plains, the Dandaragan Scarp and beyond (e.g. *F. Obbens* 27/02; *F. Obbens & F. Hort* FO 39/04; *R. Davis* 11219 etc.). Further research, perhaps including molecular investigation, is required to ascertain the status of the inland and near-coastal variants.

A number of specimens in the northern part of the range (e.g. *S. Toole et al.* 29; *F. Obbens & F. Hort*

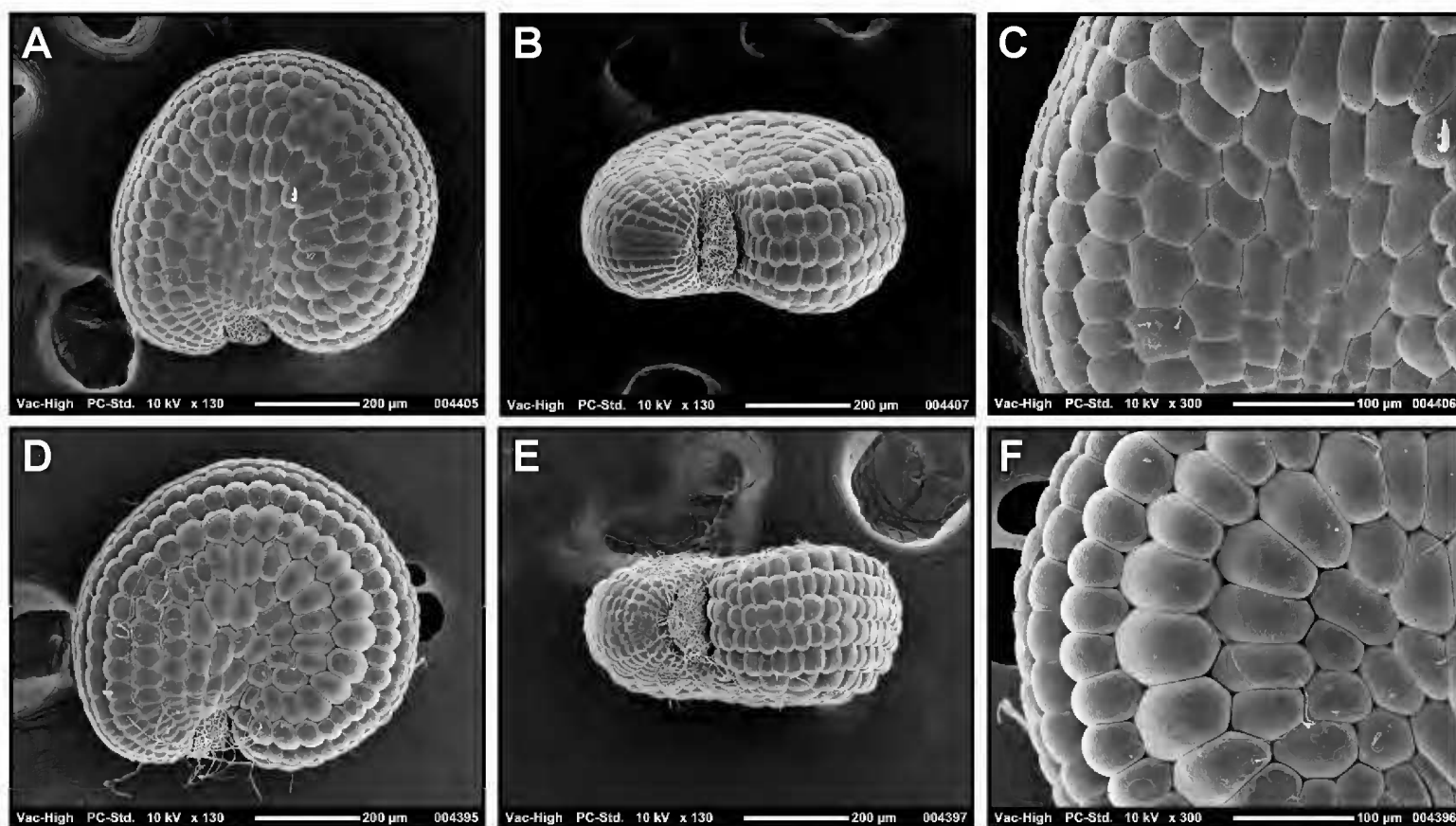


Figure 2. *Calandrinia baccata* seeds. A–C: typical inland variant. A – plan view; B – dorsal view; C – surface pattern at higher magnification. D–F: near coastal variant. D – plan view; E – dorsal view; F – surface pattern at higher magnification. A–C from *M. Hislop & M. Davis* WW 93.36; D–F from *F. Obbens* FO 39/03.

FO 50/04; *F. Obbens et al.* FO 51/08 etc.) have non-glandular hairs on the stems and/or scapes to varying degrees and sometimes small longitudinal ridges or wings on stems and/or scapes. These characteristics have not been observed on specimens from further south.

### *Calandrinia oraria* Obbens, *sp. nov.*

*Type:* Two Rocks, Western Australia [precise locality withheld for conservation reasons], 25 October 2003, *K. Richardson* 211 (*holo:* PERTH 06934374; *iso:* CANB).

*Calandrinia* sp. Two Rocks (*K. Richardson* 211), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed September 2013].

*Annual herbs*, semi-erect to erect, 60–300 mm tall, 10–180 mm wide, glabrous; root system a weak to moderately well-developed taproot with a few laterals. *Basal leaves* fleshy, narrowly linear to narrowly obovate, 10–85 mm long, 1.5–6.3 mm wide, with a prominent medial groove on adaxial surface, pale grey-green to whitish red-green. *Stems* few to several (usually 1–8), 10–140 mm long, radiating from the base, often with a short to medium, erect, sometimes thickened central stem forming an axis for other lateral stems, often producing a scape and inflorescence axis from its end. *Stem leaves* alternate, a few widely spaced, most distally clustered, fleshy, narrowly elliptic to narrowly obovate, 6.8–38 mm long, 1–4.6 mm wide, with a prominent medial groove on the adaxial surface and somewhat folded longitudinally. *Scapes* 28–110 mm long, often with one leaf/bract at midpoint along scape, occasionally once-branched. *Inflorescence* generally comprising a loose cyme; *axis* 23–130 mm long, bare except for 3–several  $\pm$  scarious bracts outside or opposite the pedicel axils, initially alternate soon becoming opposite on upper axis; *axis bracts* appressed to  $\pm$  spreading, narrowly triangular, 2.6–4.7 mm long, 1.4–2.4 mm wide, long-acuminate. *Pedicels* 9–22 mm long in flower, to 41 mm long and moderately

reflexed in fruit. *Flowers* 15–30 mm diam. *Sepals* thick, ovate to broadly ovate, 4.2–5.9 mm long, 3–4.2 mm wide, free to base, shortly mucronate, with a weak midvein with up to 12 weaker side veins. *Petals* 5, light to mid-pink, broadly obovate, often depressed or notched at apex, 8.3–14.5 mm long, 5.6–11.5 mm wide, free to base. *Stamens* (27–)45–58, in (1–)2–3 rows, alternating long and short (when one row) or with longer inner and shorter outer series (when 2 or 3 rows); filaments free, 1.5–4.1 mm long, attached to top of basal ring beneath ovary, basally adaxially papillose; anthers oblong in outline, 0.7–1 mm long, 0.45–0.55 mm wide, versatile, extrorse, dehiscent longitudinally. *Ovary* obovoid, 0.95–1.7 mm diam., brown. *Stigmas* 3, narrowly triangular, lengthening, spreading and becoming narrowly linear with maturity, 0.9–2 mm long, free to base, with a dense covering of moderately long trichomes. *Capsule* ovoid to broadly ovoid, 3.1–4.7 mm long, 2–2.7 mm wide, obtuse, usually equal to or slightly shorter than the sepals, rarely slightly longer than the sepals; valves 3, splitting from apex to base with age. *Seeds* 16–57, dark red-brown to black, dull to semi-glossy, sub-orbicular to orbicular, 0.65–0.8 mm long, 0.65–0.75 mm wide, 0.25–0.4 mm thick; surface strongly colliculate with moderately-sized and well-domed colliculi. (Figure 3 A–C)

*Diagnostic features.* *Calandrinia oraria* is a medium to large, erect plant with a thickened stem at the base, occurring in the immediate coastal zone.

*Other specimens examined.* WESTERN AUSTRALIA [localities withheld for conservation reasons]: 16 Oct. 2009, *S. Chalwell* V9070-MF06 (PERTH); 16 Oct. 2009, *S. Chalwell* V9070-SC38 (PERTH); 26 Oct. 2002, *F. & J. Hort* 1890 (PERTH); 7 Sep. 2011, *S. Kern* s.n. (PERTH); 19 Oct. 2001, *F. Littleton* 66 (PERTH); 19 Oct. 2006, *K. McCreery, V. Yeomans & A. Mercier* s.n. (PERTH); 17 Oct. 2006, *V. Yeomans, A. Mercier & K. McCreery* NH05-3 (PERTH).

*Phenology.* Flowers from late August to October with fruiting completed about 2 to 3 weeks following the first flush of bloom.

*Distribution and habitat.* *Calandrinia oraria* occurs from Green Head to Madora Bay north of Mandurah (Figure 1). It is restricted to coastal habitats in low coastal heath or forbland on small white sand dunes immediately adjacent to the beach and up to 100–150 m inland in slightly larger dunes with grey or grey-brown sands. At several sites it occurs on sand over rocky limestone. Associated species include *Acacia lasiocarpa*, *A. rostellifera*, *Acanthocarpus preissii*, *Austrostipa flavescens*, *Conostylis candicans*, *Desmocladius asper*, *Dianella revoluta*, *Leucopogon parviflorus*, *Lomandra maritima*, *Melaleuca cardiophylla*, *M. systema*, *Olearia axillaris*, *Podolepis canescens*, *Rhagodia baccata*, *Scaevola crassifolia*, *Spyridium globulosum* and numerous other subshrubs and annuals.

*Conservation status.* Recently listed as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australia Flora, under the name *Calandrinia* sp. Two Rocks (K. Richardson 211) (Western Australian Herbarium 1998–). Only nine collections of *C. oraria* are known at PERTH, several of which are from almost the same location. It is likely to be under-collected throughout its range, and could be found over a wider region if more targeted searches were undertaken. At most locations of *C. oraria* plant numbers are relatively low and some sites are moderately weed-infested. While there is usually a coastal buffer to development, *C. oraria* may be impacted adversely by increasing urbanisation, weed invasion, increased fire frequency and activities associated with fishing and recreation.

*Etymology.* From the Latin *ora* (coast) in reference to its preferred habitat adjacent to the beach or oceanfront.



Figure 3. *Calandrinia oraria* seeds. A – plan view; B – dorsal view; C – surface pattern at higher magnification. All from K. Richardson 211.

*Notes.* *Calandrinia oraria* has a superficially similar seed surface pattern to *C. baccata*, but the seed shape and strophiole of each species is quite different. They are similar in habit (semi-erect to erect) and generally similar in overall size, flower and seed size and flower structure. *Calandrinia oraria* is also similar to *C. tholiformis* Obbens, sharing with it the unusual feature of an erect, often thickened central stem from which lateral stems emerge and which terminates in a scape and inflorescence axis. These species also share a somewhat similar seed surface pattern (see Obbens 2011, Figure 5, particularly variant 2), and both occur along the coast. However, *C. oraria* differs from *C. tholiformis* in being a larger, more erect plant with larger flowers with normally many more stamens and larger seeds.

Obbens (2011), describing *C. tholiformis*, noted three collections with seeds like *C. oraria* (at that time known as *C. sp. Two Rocks*), but which were smaller plants and occurred more inland than was common for *C. oraria*. Two of these (*A. Harris s.n.*, PERTH 7771207; *G. Woodman & K. Rodda M74-3*) were from near Cataby and the third (*V. Yeomans s.n.*, PERTH 7811152) was from Grey Point on the Peel-Harvey Inlet. Since then, a further collection (*B. Loudon NEW 206-02*) from near Cataby matching these three has been made. Close examination of the three Cataby specimens reveals that the capsule valves protrude significantly beyond the sepals, unlike those of *C. oraria*. It is still unresolved as to whether these represent hybrids or a further unnamed taxon. The Grey Point collection differs slightly in habit and seed surface pattern from the Cataby specimens; this specimen may be an unusual variant of *C. tholiformis*, although the habitat of Grey Point on the eastern side of the Peel-Harvey Inlet is very different to that on the western side where *C. tholiformis* occurs, and to other areas where it normally occurs. Further investigation is required to resolve the status of these collections.

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